

SEQUENCE LISTING

<110> Edgar B. Cahoon
Rebecca E. Cahoon
William D. Hitz
Anthony J. Kinney

<120> Membrane-Bound Desaturases

<130> BB1264

<140> US/09/857,524

<141> 2001-06-04

<150> 60/110,784

<151> 1998-12-03

<160> 17

<170> Microsoft Office 97

<210> 1

<211> 1471

<212> DNA

<213> Picramnia pentandra

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<221> unsure

<222> (1402)

<223> n = A, C, G, or T

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<211> 448

<212> PRT

<213> Picramnia pentandra

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Ile	Ser	Lys	Trp	Thr	Lys	Glu	His	Pro	Gly	Gly	Glu	Leu	Pro	Leu	Leu	
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Ser	Phe	Ala	Gly	Gln	Asp	Val	Thr	Asp	Ala	Phe	Ile	Ala	Tyr	His	Pro	
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Gly	Thr	Ala	Trp	Gln	Tyr	Leu	Asp	Arg	Phe	Phe	Thr	Gly	Tyr	Tyr	Val	
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Gln	Asp	Tyr	Ser	Val	Ser	Glu	Met	Ser	Lys	Asp	Tyr	Arg	Arg	Leu	Val	
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Ser	Glu	Phe	Ser	Lys	Met	Gly	Leu	Phe	Lys	Thr	Pro	Gly	Lys	Gly	Val	
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Tyr	Cys	Ser	Ile	Phe	Phe	Val	Ser	Val	Leu	Phe	Ala	Leu	Ser	Val	Tyr	
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Cys	His	Tyr	Gln	Val	Met	Pro	Asn	Arg	Lys	Leu	Asn	Arg	Leu	Phe	Gln	
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Ile	Ile	Ala	Gly	Asn	Val	Ile	Ala	Gly	Val	Ser	Val	Ala	Trp	Trp	Lys	
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Leu	Asp	His	Asn	Thr	His	His	Phe	Ala	Cys	Asn	Ser	Ala	Asn	Leu	Asp	
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Pro	Asp	Ile	Gln	His	Leu	Pro	Ile	Ile	Ala	Ile	Ser	Pro	Lys	Phe	Phe	
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Asn	Ser	Leu	Thr	Ser	Tyr	Tyr	His	Asn	Cys	Lys	Met	Thr	Tyr	Asp	Arg	
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Ala	Ala	Arg	Phe	Phe	Val	Ser	Phe	Gln	His	Trp	Thr	Phe	Tyr	Pro	Ala	
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Leu	Leu	Ser	Val	Arg	Leu	Tyr	Leu	Phe	Ile	Leu	Ser	Phe	Lys	Val	Val	
			260					265					270			
Phe	Ser	Asn	Asn	Lys	Arg	Val	Tyr	Lys	Arg	Ser	Gln	Glu	Ile	Leu	Gly	
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Tyr	Ala	Ala	Phe	Leu	Thr	Trp	Tyr	Ser	Leu	Leu	Leu	Ser	Arg	Leu	Pro	
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1764

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 <212> PRT
 <213> Zea mays

<400> 4

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Ala Gly Asp Val Arg Met Ile Ser Ser Lys Glu Leu Arg Ala His Ala
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Ser Ala Asp Asp Leu Trp Ile Ser Ile Ser Gly Asp Val Tyr Asp Val
 35 40 45

Thr Pro Trp Leu Pro His His Pro Gly Gly Asp Leu Pro Leu Leu Thr
 50 55 60

Leu Ala Gly Gln Asp Ala Thr Asp Ala Phe Ala Ala Tyr His Pro Pro
 65 70 75 80

Ser Ala Arg Pro Leu Leu Arg Arg Phe Phe Val Gly Arg Leu Ser Asp
 85 90 95

Tyr Ala Val Ser Pro Ala Ser Ala Asp Tyr Arg Arg Leu Leu Ala Gln
 100 105 110

Leu Ser Ser Ala Gly Leu Phe Glu Arg Val Gly Pro Thr Pro Lys Val
 115 120 125

Gln Leu Val Leu Met Ala Val Leu Phe Tyr Ala Ala Leu Tyr Leu Val
 130 135 140

Leu Ala Cys Ala Ser Ala Trp Ala His Leu Leu Ala Gly Gly Leu Ile
 145 150 155 160

Gly Phe Val Trp Ile Gln Ser Gly Trp Met Gly His Asp Ser Gly His
 165 170 175

His Arg Ile Thr Gly His Pro Val Leu Asp Arg Val Val Gln Val Leu
 180 185 190

Ser Gly Asn Cys Leu Thr Gly Leu Ser Ile Ala Trp Trp Lys Cys Asn
 195 200 205

His Asn Thr His His Ile Ala Cys Asn Ser Leu Asp His Asp Pro Asp
 210 215 220

Leu Gln His Met Pro Leu Phe Ala Val Ser Pro Lys Leu Phe Gly Asn
 225 230 235 240

Ile Trp Ser Tyr Phe Tyr Gln Arg Thr Leu Ala Phe Asp Ala Ala Ser
 245 250 255

Lys Phe Phe Ile Ser Tyr Gln His Trp Thr Phe Tyr Pro Val Met Cys
 260 265 270

Ile Ala Arg Ile Asn Leu Leu Ala Gln Ser Ala Leu Phe Val Leu Thr
 275 280 285

Glu Lys Arg Val Pro Gln Arg Leu Leu Glu Ile Ala Gly Val Ala Thr
 290 295 300
 Phe Trp Ala Trp Tyr Pro Leu Leu Val Ala Ser Leu Pro Asn Trp Trp
 305 310 315 320
 Glu Arg Val Ala Phe Val Leu Phe Ser Phe Thr Ile Cys Gly Ile Gln
 325 330 335
 His Val Gln Phe Cys Leu Asn His Phe Ser Ser Asp Val Tyr Val Gly
 340 345 350
 Pro Pro Lys Gly Asn Asp Trp Phe Glu Lys Gln Thr Ala Gly Thr Leu
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 Asp Ile Leu Cys Ser Pro Trp Met Asp Trp Phe His Gly Gly Leu Gln
 370 375 380
 Phe Gln Ile Glu His His Leu Phe Pro Arg Leu Pro Arg Cys His Leu
 385 390 395 400
 Arg Lys Val Ala Pro Ala Val Arg Asp Leu Cys Lys Lys His Gly Leu
 405 410 415
 Thr Tyr Ser Ala Ala Thr Phe Trp Gly Ala Asn Val Leu Thr Trp Lys
 420 425 430
 Thr Leu Arg Ala Ala Ala Leu Gln Ala Arg Thr Ala Thr Ser Gly Gly
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 <213> Glycine max

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<213> Glycine max

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Ala Ala Ser Ser Asp Tyr Arg Lys Leu Phe Ser Asp Leu Ser Ala Leu
          20                      25                      30

```

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Asn Leu Phe Asn Arg Lys Gly His Thr Thr Ser Ile Leu Leu Ser Leu
  35                      40                      45

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```

Ile Leu Thr Leu Phe Pro Leu Ser Val Cys Gly Val Leu Phe Ser Asp
  50                      55                      60

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Ser Thr Phe Val His Val Leu Ser Ala Ala Leu Ile Gly Phe Leu Trp
 65 70 75 80
 Ile Gln Ser Gly Trp Ile Gly His Asp Ser Gly His Tyr Asn Val Met
 85 90 95
 Leu Ser Arg Arg Leu Asn Arg Ala Ile Gln Ile Leu Ser Gly Asn Ile
 100 105 110
 Leu Ala Gly Ile Ser Ile Gly Trp Trp Lys Trp Asn His Asn Ala His
 115 120 125
 His Ile Ala Cys Asn Ser Leu Asp Tyr Asp Pro Asp Leu Gln His Met
 130 135 140
 Pro Val Phe Ala Val Ser Ser Arg Phe Phe Asn Ser Ile Thr Ser His
 145 150 155 160
 Xaa Tyr Gly Arg Lys Xaa Glu Phe Asp Xaa Ile Ala Xaa Phe Leu Ile
 165 170 175
 Cys Tyr Gln His Phe Thr Phe Tyr Pro Val Met Cys Val Ala Arg Val
 180 185 190
 Asn Leu Tyr Leu Gln Thr Ile Leu Leu Leu Phe Ser Arg Xaa Lys Val
 195 200 205
 Gln Asp Arg Ala Leu Asn Ile Met Gly Ile Leu Val Phe Trp Thr Trp
 210 215 220
 Phe Leu Phe Leu Leu Ala Leu Leu Phe Val Pro Ile Gln His Ile Gln
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<210> 7
 <211> 1934
 <212> DNA
 <213> Glycine max

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aaaaaaaaaa aaaa 1934

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<210> 8
 <211> 450
 <212> PRT
 <213> Glycine max

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Val Tyr Asn Val Ser Asp Trp Val Lys Glu His Pro Gly Gly Asp Val
      35              40              45

Pro Ile Ser Asn Leu Ala Gly Gln Asp Val Thr Asp Ala Phe Ile Ala
      50              55              60

Tyr His Pro Gly Thr Ala Trp Ser His Leu Glu Lys Phe Phe Thr Gly
      65              70              75              80

Tyr His Leu Ser Asp Phe Lys Val Ser Glu Val Ser Lys Asp Tyr Arg
      85              90              95

Lys Leu Ala Ser Glu Phe Ser Lys Leu Gly Leu Phe Asp Thr Lys Gly
      100             105             110

His Val Thr Ser Cys Thr Leu Ala Ser Val Ala Val Met Phe Leu Ile
      115             120             125

Val Leu Tyr Gly Val Leu Arg Cys Thr Ser Val Trp Ala His Leu Gly
      130             135             140

Ser Gly Met Leu Leu Gly Leu Leu Trp Met Gln Ser Ala Tyr Val Gly
      145             150             155             160

His Asp Ser Gly His Tyr Val Val Met Thr Thr Asn Gly Phe Asn Lys
      165             170             175

Val Ala Gln Ile Leu Ser Gly Asn Cys Leu Thr Gly Ile Ser Ile Ala
      180             185             190

Trp Trp Lys Trp Thr His Asn Ala His His Ile Ala Cys Asn Ser Leu
      195             200             205

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Asp His Asp Pro Asp Leu Gln His Met Pro Val Phe Ala Val Ser Ser
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 Arg Phe Phe Asn Ser Ile Thr Ser His Phe Tyr Gly Arg Lys Leu Glu
 225 230 235 240
 Phe Asp Phe Ile Ala Arg Phe Leu Ile Cys Tyr Gln His Phe Thr Phe
 245 250 255
 Tyr Pro Val Met Cys Val Ala Arg Val Asn Leu Tyr Leu Gln Thr Ile
 260 265 270
 Leu Leu Leu Phe Ser Arg Arg Lys Val Gln Asp Arg Ala Leu Asn Ile
 275 280 285
 Met Gly Ile Leu Val Phe Trp Thr Trp Phe Pro Leu Leu Val Ser Cys
 290 295 300
 Leu Pro Asn Trp Pro Glu Arg Val Met Phe Val Leu Ala Ser Phe Ala
 305 310 315 320
 Val Cys Ser Ile Gln His Ile Gln Phe Cys Leu Asn His Phe Ala Ala
 325 330 335
 Asn Val Tyr Val Gly Pro Pro Ser Gly Asn Asp Trp Phe Glu Lys Gln
 340 345 350
 Thr Ser Gly Thr Leu Asp Ile Ser Cys Ala Ser Ser Met Asp Trp Phe
 355 360 365
 Phe Gly Gly Leu Gln Phe Gln Leu Glu His His Leu Phe Pro Arg Leu
 370 375 380
 Pro Arg Cys Gln Leu Arg Lys Ile Ser Pro Leu Val Ser Asp Leu Cys
 385 390 395 400
 Lys Lys His Asn Leu Pro Tyr Arg Ser Leu Ser Phe Trp Glu Ala Asn
 405 410 415
 Gln Trp Thr Ile Arg Thr Leu Arg Thr Ala Ala Leu Gln Ala Arg Asp
 420 425 430
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 His Gly
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<210> 9

<211> 1972

<212> DNA

<213> *Triticum aestivum*

<400> 9

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ctggtctggg	aagctttgaa	cactcatgga	tgactgggat	caggactgga	gtatgagaca	1560
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atattgatcc	ttttagctgt	tggaaatcgt	ttggattttt	cgtgttgcca	ggtgactatc	1680
tttgcagttc	aatcgtgggt	tcatgcttca	gttgtgtact	tgtacaccat	atttagattg	1740
ttgggttctc	cctatcatgg	taactacatc	aatagtactt	gatttacatc	ataaaatccg	1800
tggcttatct	ttacatccat	ttcattttgc	ttgcaagttc	atgaaactgt	aaactcaatt	1860
gatggtttgt	agcgtgtata	tcctgctgct	atggcagctt	gaactgcatt	ttgggaacat	1920
gacgattcca	ataataaacg	tttagacatt	ttctaaaaaa	aaaaaaaaaa	aa	1972

<210> 10

<211> 469

<212> PRT

<213> Triticum aestivum

<400> 10

Met	Ala	Arg	Thr	Gly	Leu	Ala	Asp	Ala	Thr	Ala	Pro	Glu	Ala	Asp	Ala
1				5					10					15	

Met	Pro	Ala	Ala	Ser	Lys	Asp	Ala	Ala	Asp	Val	Arg	Met	Ile	Ser	Thr
			20					25					30		

Lys	Glu	Leu	Gln	Ala	His	Ala	Ala	Ala	Asp	Asp	Leu	Trp	Ile	Ser	Ile
		35					40					45			

Ser	Gly	Asp	Val	Tyr	Asp	Val	Thr	Pro	Trp	Leu	Arg	His	His	Pro	Gly
	50					55					60				

Gly	Glu	Val	Pro	Leu	Ile	Thr	Leu	Ala	Gly	Gln	Asp	Ala	Thr	Asp	Ala
	65				70					75					80

Phe	Met	Ala	Tyr	His	Pro	Pro	Ser	Val	Arg	Pro	Leu	Leu	Arg	Arg	Phe
				85					90					95	

Phe	Val	Gly	Arg	Leu	Ser	Asp	Tyr	Thr	Val	Pro	Pro	Ala	Ser	Ala	Asp
			100					105					110		

Phe	Arg	Arg	Leu	Leu	Ala	Gln	Leu	Ser	Ser	Ala	Gly	Leu	Phe	Glu	Arg
			115				120					125			

Val	Gly	His	Thr	Pro	Lys	Phe	Leu	Leu	Val	Ala	Met	Ser	Val	Leu	Phe
		130				135					140				

Cys	Ile	Ala	Leu	Tyr	Cys	Val	Leu	Ala	Cys	Ser	Ser	Thr	Gly	Ala	His
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

145	150	155	160
Met Phe Ala Gly Gly Leu Ile Gly Phe Ile Trp Ile Gln Ser Gly Trp	165	170	175
Ile Gly His Asp Ser Gly His His Gln Ile Thr Arg His Pro Ala Leu	180	185	190
Asn Arg Leu Leu Gln Val Val Ser Gly Asn Cys Leu Thr Gly Leu Gly	195	200	205
Ile Ala Trp Trp Lys Phe Asn His Asn Thr His His Ile Ser Cys Asn	210	215	220
Ser Leu Asp His Asp Pro Asp Leu Gln His Leu Pro Leu Phe Ala Val	225	230	235
Ser Thr Lys Leu Phe Asn Asn Leu Trp Ser Val Cys Tyr Glu Arg Thr	245	250	255
Leu Ala Phe Asp Ala Ile Ser Lys Phe Phe Val Ser Tyr Gln His Trp	260	265	270
Thr Phe Tyr Pro Val Met Gly Phe Ala Arg Ile Asn Leu Leu Val Gln	275	280	285
Ser Ile Val Phe Leu Ile Thr Gln Lys Lys Val Arg Gln Arg Trp Leu	290	295	300
Glu Ile Ala Gly Val Ala Ala Phe Trp Val Trp Tyr Pro Leu Leu Val	305	310	315
Ser Cys Leu Pro Asn Trp Trp Glu Arg Val Ala Phe Val Leu Ala Ser	325	330	335
Phe Val Ile Thr Gly Ile Gln His Val Gln Phe Cys Leu Asn His Phe	340	345	350
Ser Ser Ala Val Tyr Val Gly Pro Pro Lys Gly Asn Asp Trp Phe Glu	355	360	365
Arg Gln Thr Ala Gly Thr Leu Asp Ile Lys Cys Ser Pro Trp Met Asp	370	375	380
Trp Phe His Gly Gly Leu Gln Phe Gln Val Glu His His Leu Phe Pro	385	390	395
Arg Leu Pro Arg Cys His Tyr Arg Met Val Ala Pro Ile Val Arg Asp	405	410	415
Leu Cys Lys Lys His Gly Leu Ser Tyr Gly Ala Ala Thr Phe Trp Glu	420	425	430
Ala Asn Val Met Thr Trp Lys Thr Leu Arg Ala Ala Ala Leu Gln Ala	435	440	445
Arg Glu Ala Thr Thr Gly Ala Ala Pro Lys Asn Leu Val Trp Glu Ala	450	455	460
Leu Asn Thr His Gly	465		

<210> 11
 <211> 448
 <212> PRT
 <213> Borago officinalis

<400> 11

Met	Ala	Ala	Gln	Ile	Lys	Lys	Tyr	Ile	Thr	Ser	Asp	Glu	Leu	Lys	Asn	1	5	10	15
His	Asp	Lys	Pro	Gly	Asp	Leu	Trp	Ile	Ser	Ile	Gln	Gly	Lys	Ala	Tyr	20	25	30	
Asp	Val	Ser	Asp	Trp	Val	Lys	Asp	His	Pro	Gly	Gly	Ser	Phe	Pro	Leu	35	40	45	
Lys	Ser	Leu	Ala	Gly	Gln	Glu	Val	Thr	Asp	Ala	Phe	Val	Ala	Phe	His	50	55	60	
Pro	Ala	Ser	Thr	Trp	Lys	Asn	Leu	Asp	Lys	Phe	Phe	Thr	Gly	Tyr	Tyr	65	70	75	80
Leu	Lys	Asp	Tyr	Ser	Val	Ser	Glu	Val	Ser	Lys	Asp	Tyr	Arg	Lys	Leu	85	90	95	
Val	Phe	Glu	Phe	Ser	Lys	Met	Gly	Leu	Tyr	Asp	Lys	Lys	Gly	His	Ile	100	105	110	
Met	Phe	Ala	Thr	Leu	Cys	Phe	Ile	Ala	Met	Leu	Phe	Ala	Met	Ser	Val	115	120	125	
Tyr	Gly	Val	Leu	Phe	Cys	Glu	Gly	Val	Leu	Val	His	Leu	Phe	Ser	Gly	130	135	140	
Cys	Leu	Met	Gly	Phe	Leu	Trp	Ile	Gln	Ser	Gly	Trp	Ile	Gly	His	Asp	145	150	155	160
Ala	Gly	His	Tyr	Met	Val	Val	Ser	Asp	Ser	Arg	Leu	Asn	Lys	Phe	Met	165	170	175	
Gly	Ile	Phe	Ala	Ala	Asn	Cys	Leu	Ser	Gly	Ile	Ser	Ile	Gly	Trp	Trp	180	185	190	
Lys	Trp	Asn	His	Asn	Ala	His	His	Ile	Ala	Cys	Asn	Ser	Leu	Glu	Tyr	195	200	205	
Asp	Pro	Asp	Leu	Gln	Tyr	Ile	Pro	Phe	Leu	Val	Val	Ser	Ser	Lys	Phe	210	215	220	
Phe	Gly	Ser	Leu	Thr	Ser	His	Phe	Tyr	Glu	Lys	Arg	Leu	Thr	Phe	Asp	225	230	235	240
Ser	Leu	Ser	Arg	Phe	Phe	Val	Ser	Tyr	Gln	His	Trp	Thr	Phe	Tyr	Pro	245	250	255	
Ile	Met	Cys	Ala	Ala	Arg	Leu	Asn	Met	Tyr	Val	Gln	Ser	Leu	Ile	Met	260	265	270	
Leu	Leu	Thr	Lys	Arg	Asn	Val	Ser	Tyr	Arg	Ala	His	Glu	Leu	Leu	Gly	275	280	285	

Cys Leu Val Phe Ser Ile Trp Tyr Pro Leu Leu Val Ser Cys Leu Pro
 290 295 300

Asn Trp Gly Glu Arg Ile Met Phe Val Ile Ala Ser Leu Ser Val Thr
 305 310 315 320

Gly Met Gln Gln Val Gln Phe Ser Leu Asn His Phe Ser Ser Ser Val
 325 330 335

Tyr Val Gly Lys Pro Lys Gly Asn Asn Trp Phe Glu Lys Gln Thr Asp
 340 345 350

Gly Thr Leu Asp Ile Ser Cys Pro Pro Trp Met Asp Trp Phe His Gly
 355 360 365

Gly Leu Gln Phe Gln Ile Glu His His Leu Phe Pro Lys Met Pro Arg
 370 375 380

Cys Asn Leu Arg Lys Ile Ser Pro Tyr Val Ile Glu Leu Cys Lys Lys
 385 390 395 400

His Asn Leu Pro Tyr Asn Tyr Ala Ser Phe Ser Lys Ala Asn Glu Met
 405 410 415

Thr Leu Arg Thr Leu Arg Asn Thr Ala Leu Gln Ala Arg Asp Ile Thr
 420 425 430

Lys Pro Leu Pro Lys Asn Leu Val Trp Glu Ala Leu His Thr His Gly
 435 440 445

<210> 12
 <211> 469
 <212> PRT
 <213> Triticum aestivum

<400> 12
 Met Ala Arg Thr Gly Leu Ala Asp Ala Thr Ala Pro Glu Ala Asp Ala
 1 5 10 15

Met Pro Ala Ala Ser Lys Asp Ala Ala Asp Val Arg Met Ile Ser Thr
 20 25 30

Lys Glu Leu Gln Ala His Ala Ala Ala Asp Asp Leu Trp Ile Ser Ile
 35 40 45

Ser Gly Asp Val Tyr Asp Val Thr Pro Trp Leu Arg His His Pro Gly
 50 55 60

Gly Glu Val Pro Leu Ile Thr Leu Ala Gly Gln Asp Ala Thr Asp Ala
 65 70 75 80

Phe Met Ala Tyr His Pro Pro Ser Val Arg Pro Leu Leu Arg Arg Phe
 85 90 95

Phe Val Gly Arg Leu Thr Asp Tyr Thr Val Pro Pro Ala Ser Ala Asp
 100 105 110

Phe Arg Arg Leu Leu Ala Gln Leu Ser Ser Ala Gly Leu Phe Glu Arg
 115 120 125

Val Gly His Thr Pro Lys Phe Leu Leu Val Ala Met Ser Val Leu Phe

130					135					140					
Cys	Ile	Ala	Leu	Tyr	Cys	Val	Leu	Ala	Cys	Ser	Ser	Thr	Gly	Ala	His
145					150					155					160
Met	Phe	Ala	Gly	Gly	Leu	Ile	Gly	Phe	Ile	Trp	Ile	Gln	Ser	Gly	Trp
				165					170					175	
Ile	Gly	His	Asp	Ser	Gly	His	His	Gln	Ile	Thr	Arg	His	Pro	Ala	Leu
			180					185					190		
Asn	Arg	Leu	Leu	Gln	Val	Val	Ser	Gly	Asn	Cys	Leu	Thr	Gly	Leu	Gly
			195				200					205			
Ile	Ala	Trp	Trp	Lys	Phe	Asn	His	Asn	Thr	His	His	Ile	Ser	Cys	Asn
	210					215					220				
Ser	Leu	Asp	His	Asp	Pro	Asp	Leu	Gln	His	Leu	Pro	Leu	Phe	Ala	Val
225					230					235					240
Ser	Thr	Lys	Leu	Phe	Asn	Asn	Leu	Trp	Ser	Val	Cys	Tyr	Glu	Arg	Thr
				245					250					255	
Leu	Ala	Phe	Asp	Ala	Ile	Ser	Lys	Phe	Phe	Val	Ser	Tyr	Gln	His	Trp
			260					265					270		
Thr	Phe	Tyr	Pro	Val	Met	Gly	Phe	Ala	Arg	Ile	Asn	Leu	Leu	Val	Gln
		275					280					285			
Ser	Ile	Val	Phe	Leu	Ile	Thr	Gln	Lys	Lys	Val	Arg	Gln	Arg	Trp	Leu
	290					295					300				
Glu	Ile	Ala	Gly	Val	Ala	Ala	Phe	Trp	Val	Trp	Tyr	Pro	Leu	Leu	Val
305					310					315					320
Ser	Cys	Leu	Pro	Asn	Trp	Trp	Glu	Arg	Val	Ala	Phe	Val	Leu	Ala	Ser
				325					330					335	
Phe	Val	Ile	Thr	Gly	Ile	Gln	His	Val	Gln	Phe	Cys	Leu	Asn	His	Phe
			340					345					350		
Ser	Ser	Ala	Val	Tyr	Val	Gly	Pro	Pro	Lys	Gly	Asn	Asp	Trp	Phe	Glu
		355					360					365			
Arg	Gln	Thr	Ala	Gly	Thr	Leu	Asp	Ile	Lys	Cys	Ser	Pro	Trp	Met	Asp
						375					380				
Trp	Phe	His	Gly	Gly	Leu	Gln	Phe	Gln	Val	Glu	His	His	Leu	Phe	Pro
385					390					395					400
Arg	Leu	Pro	Arg	Cys	His	Tyr	Arg	Met	Val	Ala	Pro	Ile	Val	Arg	Asp
				405					410					415	
Leu	Cys	Lys	Lys	His	Gly	Leu	Ser	Tyr	Gly	Ala	Ala	Thr	Phe	Trp	Glu
			420					425					430		
Ala	Asn	Val	Met	Thr	Trp	Lys	Thr	Leu	Arg	Ala	Ala	Ala	Leu	Gln	Ala
		435					440					445			
Arg	Glu	Ala	Thr	Thr	Gly	Ala	Ala	Pro	Lys	Asn	Leu	Val	Trp	Glu	Ala
	450					455					460				

Leu Asn Thr His Gly
465

<210> 13
<211> 458
<212> PRT
<213> Helianthus annuus

<400> 13
Met Val Ser Pro Ser Ile Glu Val Leu Asn Ser Ile Ala Asp Gly Lys
1 5 10 15
Lys Tyr Ile Thr Ser Lys Glu Leu Lys Lys His Asn Asn Pro Asn Asp
20 25 30
Leu Trp Ile Ser Ile Leu Gly Lys Val Tyr Asn Val Thr Glu Trp Ala
35 40 45
Lys Glu His Pro Gly Gly Asp Ala Pro Leu Ile Asn Leu Ala Gly Gln
50 55 60
Asp Val Thr Asp Ala Phe Ile Ala Phe His Pro Gly Thr Ala Trp Lys
65 70 75 80
His Leu Asp Lys Leu Phe Thr Gly Tyr His Leu Lys Asp Tyr Gln Val
85 90 95
Ser Asp Ile Ser Arg Asp Tyr Arg Lys Leu Ala Ser Glu Phe Ala Lys
100 105 110
Ala Gly Met Phe Glu Lys Lys Gly His Gly Val Ile Tyr Ser Leu Cys
115 120 125
Phe Val Ser Leu Leu Leu Ser Ala Cys Val Tyr Gly Val Leu Tyr Ser
130 135 140
Gly Ser Phe Trp Ile His Met Leu Ser Gly Ala Ile Leu Gly Leu Ala
145 150 155 160
Trp Met Gln Ile Ala Tyr Leu Gly His Asp Ala Gly His Tyr Gln Met
165 170 175
Met Ala Thr Arg Gly Trp Asn Lys Phe Ala Gly Ile Phe Ile Gly Asn
180 185 190
Cys Ile Thr Gly Ile Ser Ile Ala Trp Trp Lys Trp Thr His Asn Ala
195 200 205
His His Ile Ala Cys Asn Ser Leu Asp Tyr Asp Pro Asp Leu Gln His
210 215 220
Leu Pro Met Leu Ala Val Ser Ser Lys Leu Phe Asn Ser Ile Thr Ser
225 230 235 240
Val Phe Tyr Gly Arg Gln Leu Thr Phe Asp Pro Leu Ala Arg Phe Phe
245 250 255
Val Ser Tyr Gln His Tyr Leu Tyr Tyr Pro Ile Met Cys Val Ala Arg
260 265 270

Val Asn Leu Tyr Leu Gln Thr Ile Leu Leu Leu Ile Ser Lys Arg Lys
 275 280 285
 Ile Pro Asp Arg Gly Leu Asn Ile Leu Gly Thr Leu Ile Phe Trp Thr
 290 295 300
 Trp Phe Pro Leu Leu Val Ser Arg Leu Pro Asn Trp Pro Glu Arg Val
 305 310 315 320
 Ala Phe Val Leu Val Ser Phe Cys Val Thr Gly Ile Gln His Ile Gln
 325 330 335
 Phe Thr Leu Asn His Phe Ser Gly Asp Val Tyr Val Gly Pro Pro Lys
 340 345 350
 Gly Asp Asn Trp Phe Glu Lys Gln Thr Arg Gly Thr Ile Asp Ile Ala
 355 360 365
 Cys Ser Ser Trp Met Asp Trp Phe Phe Gly Gly Leu Gln Phe Gln Leu
 370 375 380
 Glu His His Leu Phe Pro Arg Leu Pro Arg Cys His Leu Arg Ser Ile
 385 390 395 400
 Ser Pro Ile Cys Arg Glu Leu Cys Lys Lys Tyr Asn Leu Pro Tyr Val
 405 410 415
 Ser Leu Ser Phe Tyr Asp Ala Asn Val Thr Thr Leu Lys Thr Leu Arg
 420 425 430
 Thr Ala Ala Leu Gln Ala Arg Asp Leu Thr Asn Pro Ala Pro Gln Asn
 435 440 445
 Leu Ala Trp Glu Ala Phe Asn Thr His Gly
 450 455

<210> 14
 <211> 35
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Definition of Artificial Sequence: PCR primer for 5' of pk0011.d5

<400> 14
 ttgcggccg caaatcaatg gaagaagcaa agaag 35

<210> 15
 <211> 33
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Definition of Sequence: antisense PCR primer for 3' of pk0011.d5

<400> 15
 ttgcggccg ccaggattca cccgaaagtg ttc 33

<210> 16
 <211> 823
 <212> DNA

<213> Triticum aestivum

<220>

<221> unsure

<222> (48)

<223> n = A, C, G, or T

<220>

<221> unsure

<222> (538)

<223> n = A, C, G, or T

<220>

<221> unsure

<222> (686)

<223> n = A, C, G, or T

<220>

<221> unsure

<222> (704)

<223> n = A, C, G, or T

<220>

<221> unsure

<222> (717)

<223> n = A, C, G, or T

<220>

<221> unsure

<222> (727)

<223> n = A, C, G, or T

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<221> unsure

<222> (729)

<223> n = A, C, G, or T

<220>

<221> unsure

<222> (737)

<223> n = A, C, G, or T

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<221> unsure

<222> (741)

<223> n = A, C, G, or T

<220>

<221> unsure

<222> (750)..(751)

<223> n = A, C, G, or T

<220>

<221> unsure

<222> (769)

<223> n = A, C, G, or T

<220>

<221> unsure

<222> (777)

<223> n = A, C, G, or T

<220>
 <221> unsure
 <222> (807)
 <223> n = A, C, G, or T

<400> 16
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 cttcctcctg agtcctgacc acccctcctc gcgctccagc taaatccaag ccaccgatgg 120
 cccgcacggg cttcgcggaac gcaacggcgc cggaagccga cgcaatgccg gccgccagca 180
 aggacgccgc cgacgtccgc atgatctcca ccaaggagct gcaggcgac gccgccgcgg 240
 acgacctctg gatctccatc tccggggacg tctacgacgt cacgccctgg ctgcgccacc 300
 acccgggcgg cgaggtcccg ctcatcacc tgcgcggcca ggacgccacc gacgccttca 360
 tggcctacca cccgccctcc gtgcgcccgc tctcgcgcg cttcttcgtc ggccgcctca 420
 ccgactacac tgtccccccc gcctccgcgc acttccgcgc cctcctcgcg cagctctcct 480
 ccgcgggcct cttcgagcgc gtgcgcacac ccccaagttc ctgctcgtcg caaagtngt 540
 gctcttctgc atcggcctct actgctcctc gcctgctcaa caccggggcc acatgttcgc 600
 cgggggctca ttggcttata tggtcagtcg ggctggattg gcatactccg gcacacaaat 660
 cacaggcacc tgcctcaacg ctctgnagtg gctcgggaat gctnacggct cggatcnctg 720
 gggagtnanc acacaanaca nattctgaan ngtcacatac ctgactcana ttccgtntcg 780
 ggtcacaagt ctaaaacttg catcgtnaag acttggttag cat 823

<210> 17
 <211> 114
 <212> PRT
 <213> Triticum aestivum

<400> 17
 Met Pro Ala Ala Ser Lys Asp Ala Ala Asp Val Arg Met Ile Ser Thr
 1 5 10 15
 Lys Glu Leu Gln Ala His Ala Ala Ala Asp Asp Leu Trp Ile Ser Ile
 20 25 30
 Ser Gly Asp Val Tyr Asp Val Thr Pro Trp Leu Arg His His Pro Gly
 35 40 45
 Gly Glu Val Pro Leu Ile Thr Leu Ala Gly Gln Asp Ala Thr Asp Ala
 50 55 60
 Phe Met Ala Tyr His Pro Pro Ser Val Arg Pro Leu Leu Arg Arg Phe
 65 70 75 80
 Phe Val Gly Arg Leu Thr Asp Tyr Thr Val Pro Pro Ala Ser Ala Asp
 85 90 95
 Phe Arg Arg Leu Leu Ala Gln Leu Ser Ser Ala Gly Leu Phe Glu Arg
 100 105 110
 Val Gly